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RADIO ASTRONOMY STATUS REPORT NO. 22

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CONTENTS

RADIO ASTRONOMY STATUS REPORT NO. 22

ABSTRACT

Prepublication work on the quiet sun paper is being continued. Computations have been made and the results plotted to show the dependence of quiet sun brightness at 300 Mc/s on assumed chromospheric and coronal temperatures.

The program of cooperation with the McMath-Hulbert Observatory is being continued.

200 Mc interferometer observations taken during 1951-52 have been reduced.

The daily information service to the Central Radio Propagation Laboratory, National Bureau of Standards, and the cooperation with the Institute of Nuclear Studies, University of Chicago, are continuing. 200 Mc daily solar data have been prepared for the International Astronomical Union.

Hourly records of solar radiation characteristics at 200 Mc are listed in tables.

Daily observations of the sun on 200 Mc with the solar mount and daily interferometer observations on 200 Mc during upper transit of the sun have been continued.

Professor M. E. Carpenter attended the eighty-eighth meeting

of the American Astronomical Society held at Amherst College 28-31 December 1952.

Appendix I lists references which have been collected for inclusion in future issues of the bibliography.

RADIO ASTRONOMY STATUS REPORT NO. 22

STAFF

Chas. R. Burrows	Director, School of Electrical Engineering Project Supervisor
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D. Ruffman	Computer, Half-time
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SCOPE OF PROJECT

The project conducts research in radio astronomy including an investigation of the noise and wave propagation characteristics of the stratosphere in order to determine the natural limitations imposed on electronic methods for tracking and searching of objects passing through the stratosphere. In the investigation, studies will be made of the following problems:

(a) determination of noise magnitudes and apparent source directions;

(b) determination of magnitude and regularity of high altitude

reflections;

(c) determination of absorbing bands;

(d) correlation of (a), (b) and (c) above, with the weather, time of day, seasonal variations and astronomical positions;

(e) observations over as wide a frequency range as possible.

The design and construction of a microwave telescope and performance of a general survey of the most useful properties of such telescope with respect to the field of research specified will be made.

STATUS

A. THEORETICAL WORK

1. Theory of the Solar Atmosphere

Pre-publication work on the quiet sun paper is being continued along with an investigation of the ways in which the present theory might be modified to yield better agreement with the latest observational results.

Some of the most significant observations of radio brightness at 3000 Mc/s (10 cm) should soon be available from A. E. Covington who recently put into operation a novel antenna having a very narrow beam angle (0.15° beamwidth). Through a comparison of Covington's data with the brightness curves predicted by the quiet sun theory that was described in Radio Astronomy Status Report No. 20, it is hoped that more definite conclusions can be drawn regarding the chromospheric and coronal temperatures. The dependence of these

brightness curves on the assumed coronal temperature T_c for the single chromospheric temperature, $T_{ch} = 30{,}000^{\circ}K$, was shown in Fig. 9c of Status Report No. 20. (Note: Read $.25 \times 10^6$ in place of 2.5×10^6 in Fig. 9c). Additional calculations have since been made to determine the dependence on assumed chromospheric temperature, and the results are plotted in Fig. 1. Note that limb brightening occurs in all cases, with its maximum at $P = P_c = 1.0188$ corresponding to the ray that is tangential to the chromosphere-corona boundary. For $P \gg P_c$, the effective or brightness temperature T_e depends only on T_c, in accordance with the relation

$$T_e = (1 - e^{-2\tau_c})T_c$$

where τ_c is the optical depth to the turning point in the corona. For $P \ll P_c$, T_e depends on T_{ch} as well, but the difference $T_e - T_{ch}$ is very nearly independent of T_{ch}. This follows from the fact that the total chromospheric opacity $2\tau_{ch}$ is much greater than unity for all rays except those infinitesimally close to $P = P_c$. Thus the general expression for effective temperature when $P \leq P_c$ (equation 41 of Status Report No. 20) reduces to

$$T_e = T_c(1-e^{-\tau_c}) + T_{ch}\, e^{-\tau_c}$$

which also may be written

$$T_e - T_{ch} = \frac{T_c - T_{ch}}{T_c}\left[(1 - e^{-\tau_c})\right] T_c$$

The factor in square brackets depends only on T_c, while the ratio $\frac{T_c - T_{ch}}{T_c}$ is practically unity for most assumed values of T_c and T_{ch}.

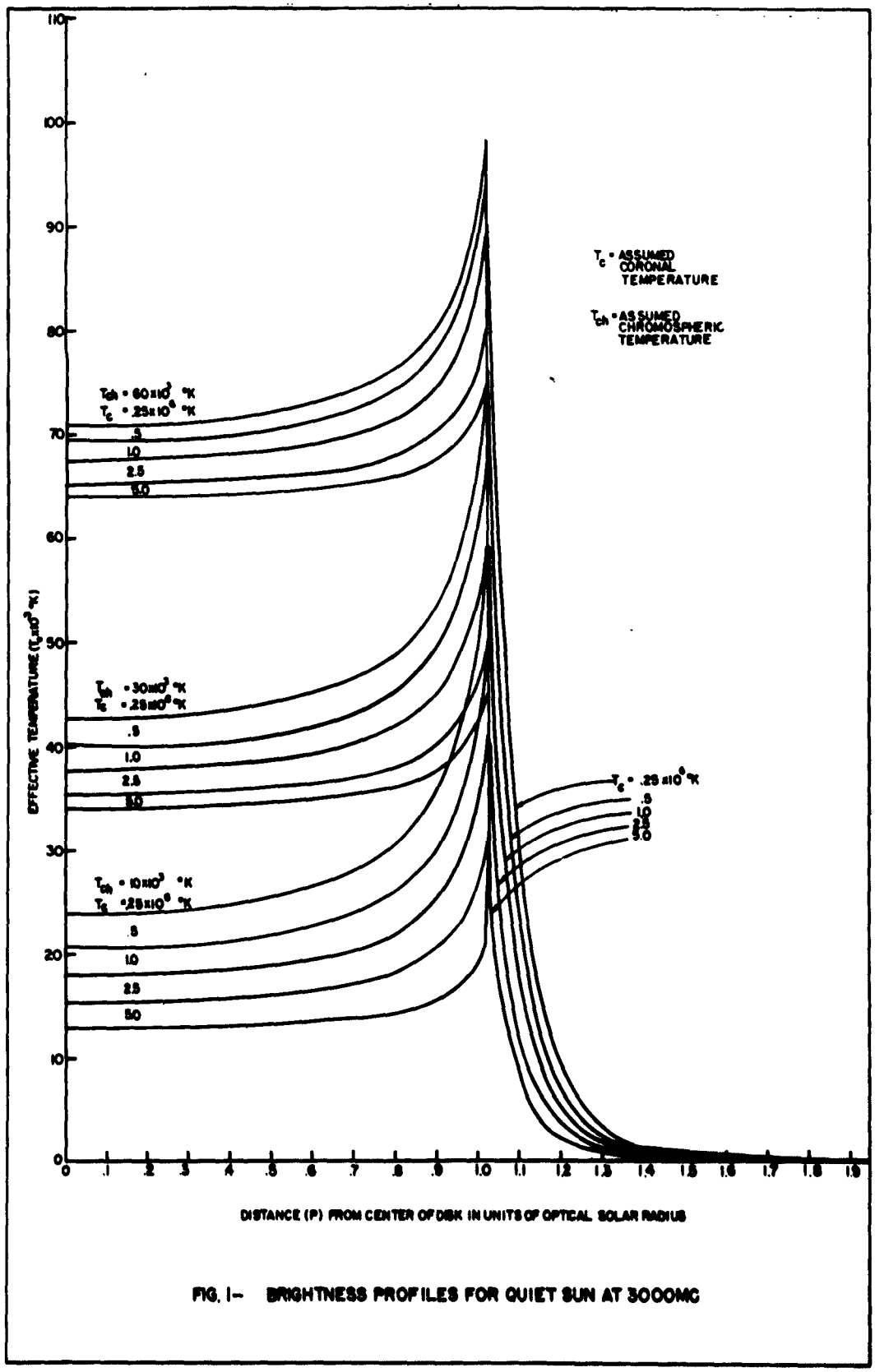

FIG. 1– BRIGHTNESS PROFILES FOR QUIET SUN AT 3000MC

It is hoped that the results of comparing these curves with Mr. Covington's data can be reported in the next Status Report.

B. ANALYSIS OF SOLAR OBSERVATIONS

1. Cooperation with the McMath-Hulbert Observatory

The program of cooperation with the McMath-Hulbert Observatory is being continued.

The joint paper "Solar Flares and Associated 200 Mc/s Radiation" by Helen W. Dodson, Ruth E. Hedeman and Leif Owren has been submitted to the Astrophysical Journal for publication.

2. Interferometer Observations

Interferometer observations at 200 Mc of active regions on the sun for the period June 1951 - June 1952 have been reduced.

3. Solar Observations 1948-1952

The work on the reduction and tabulation of the solar data for 1948-1950 have been completed. The tables of the solar observations 1948-1950 will shortly be issued as a technical report.

The reduction and tabulation of the solar observations made during 1951-1952 will be completed with the next three months and will similarly be made available as a technical report.

4. Daily Data for CRPL

The daily information service to the Central Radio Propagation Laboratory, National Bureau of Standards, is being continued.

5. Cooperation with the Institute of Nuclear Studies

The program of cooperation with the Institute of Nuclear Studies, University of Chicago, is being continued.

6. International Cooperation

200 Mc data for the third quarter of 1952 to be included in the Bulletin of Solar Activity of the International Astronomical Union have been prepared and sent to the Editor. The corresponding 200 Mc data for the fourth quarter of 1952 have been prepared.

7. Hourly Record of Solar Characteristics

The data obtained for the period July-December 1952 from the 12 inch/hour records of the sun at 200 Mc are listed in a table on pages 12 - 17.

C. CURRENT OBSERVATIONS

1. The Sun

The daily observations of the sun on 200 Mc during upper transit of the sun have been continued.

During the period 1 October - 31 December 1952 daily solar observations were made on all days except on 4-5 October, 27 November and 25 December.

Interferometer records of the sun were taken on all days except on 3, 4, 15 October, 9, 15, 16, 17, 21, 27, 29 November and 25 December.

2. Point Source Search

Twelve interferometer tapes for the point source search, representing almost 150 hours of observation between sunset and sunrise, were recorded between 15 October 1952 and 3 November 1952. Since the latter date, work on this program has been temporarily suspended while modifications of the equipment have been in progress.

D. EQUIPMENT

1. Telescope

To facilitate simultaneous observations with the telescope on 200 and 1420 Mc, a new double feed was designed and submitted to the shop for construction. The 1420 part of the feed is complete and ready for matching. Revisions were made in the telescope control system for easier remote-local control, and additions were made for better motor overload protection.

2. 1420 Mc Receiver

Due to sliding finger contacts in the oscillator cavity of this receiver, it was found that the stability required for continuous solar observations could not be obtained. Work on the design of a new, crystal controlled frequency multiplier type oscillator is under way.

3. Absolute Antenna Calibration

The calibration antennas were provided with a mechanical altitude setting mechanism to enable an observer to set these antennas to any desired altitude angle from the ground. Initial measurements of sky points with these antennas have been made for comparison with identical and simultaneous measurements with the solar mount. Analysis of this data is in progress.

4. Interferometer

By actual measurement it was found that the two interferometer feed cables showed a differential variation in their electrical lengths due to the effect of temperature variation on the dielec-

tric constant of the cable. To eliminate this effect, both cables were buried five inches under-ground. Subsequent data taken is now under study.

5. Time Marking on Tapes

Final adjustment on the 60-cycle frequency standard has been made, and as far as can be measured, the accuracy is now one second in 360 hours. There are no detectable variations in rate.

E. CONTACTS

Professor M. E. Carpenter attended the eighty-eighth meeting of the American Astronomical Society held at Amherst College 28-31 December 1952. Two of the papers presented at this meeting dealt with radio astronomy.

F. BIBLIOGRAPHY

The collection of references and preparation of abstracts for inclusion in Supplements to the "Bibliography of Extraterrestrial Radio Noise" (Radio Astronomy Technical Report No. 11) has continued. Recent additions to the list of references are given in Appendix I.

PROGRAM FOR THE NEXT INTERVAL

1. Work on the quiet sun paper will be continued and development of a more refined theory of the quiet sun radiation will be undertaken.
2. Continuation of the analysis of solar observations and of the program of cooperation with the McMath-Hulbert Obser-

vatory.

3. Continuation of the daily solar observations of the sun on 200 Mc with solar mount and radio interferometer.

4. Continued collection and abstracting of radio astronomy papers for inclusion in future bibliography supplements.

TABLE I

HOURLY RECORDS OF SOLAR NOISE CHARACTERISTICS AT 200 Mc

JULY 1952

UT Date	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22
1	/4.2CY3	3.4CY3	3.4CY3	4.2CY3	3.8CY3	4.7CX3	2.4BY3	1.7BY1	1.5AX1/	
2	/1.1	1.1	1.0	1.0	1.0	1.0	1.3BY3	4.2CY3	2.4BY3/	
3		1.8BY	1.6BY3	1.6BY4	1.3BY3/	1.1AY1	1.1Ax1/	1.1AX1/	1.1/	
4							/1.0Q	1.0Q	1.0Q	1.0Q
5				/1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	
6					/1.0Q	1.0Q	1.0Q	1.0Q		
7	/1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/	
8	/1.2AX1	1.2AY2	1.3AY2	1.4BY3	1.3AY1	1.2AY2	1.2AY1	1.0AY2	1.0AX1/	
9		1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1/	
10	/1.0AY2	1.0BY3	1.0BY3	1.0BY3	1.1BY3	/1.2BX2	/1.3BY3	1.5BY3	1.2BY3/	
11	/2.7BX3	2.1BX3	2.1BX3	1.6BZ3	1.3BY3/		/0.8AY3	0.8AY3	0.8BY3/	
12	/1.1BY2	1.3BY3	1.3BY3*	1.3BX3*	1.2BY3	1.2BX2	1.3BZ3	1.3AZ3	1.5AY3/	
13	/2.3BY	2.3BY	2.0CX	1.9CX3	1.4BY3	1.4BY3	1.4BY3	1.3BY3	1.2AX2/	
14	/1.0AZ2	1.1Q	1.1Q*	1.1Q	1.1AZ3	1.2Q	1.1Q	1.1Q	1.1Q/	
15	/1.0AZ1	1.0Q	1.0Q	1.0AZ3	1.0Q	1.1	1.0	1.0Q	1.0Q/	
16		/1.1Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0		
17	/1.0Q	1.0Q	1.0Q		1.0Q	1.1Q	1.0Q	1.0Q	1.1Q/	
18		1.1Q	1.1Q			1.1Q	1.1AZ2	1.1Q		
19			/1.1Q	1.0Q	1.0Q/					
22	/1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.2Q	1.1Q	1.1Q	1.1Q/	
23		/1.1Q	1.1Q/		/1.1	1.2	1.2	/1.1	1.1/	
24	/1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q/	
25	/1.1Q	1.1AY2	1.1AY1	1.2AY2	1.2AY2	1.2AX1	1.2AX1	1.1AY1	1.1AX1/	
26					/1.3BY2	1.3BY3	1.3CY2	1.6CX2	1.5CX2	
27				/2.4BY2	2.1BY2	2.1CY2	2.3CX	2.6CX/		
28	/2.4CY*		3.2CZ3*	3.0BY3	3.7CY3*	3.0CY3	2.5BY3	2.1BZ3*	2.1BY2/	
29	/1.5BX1	1.4BZ3	1.4BY3	1.3AZ3	1.2AZ3	1.1AZ3	1.1AY3	1.1BX3	1.1AZ3/	
30	/1.1AZ3	1.2AY2	1.2AY3/		1.1AZ3	1.2BY3	1.2BX2/	1.2AY3	1.2AY2/	
31	/1.0AZ3	1.1AZ3	1.1AZ3	1.1AZ3	1.0AZ3	1.0Q	1.0AY2	1.1AX1	1.0AY1/	

QUIET SUN = 2.25

AUGUST 1952

UT Date	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
1	/1.1AY3	1.1AZ3	1.0Q	1.0AZ3	1.0Q	1.0Q	1.0AZ3	1.0AZ3	1.0Q/
2	/1.9	1.8	/1.8Z3	1.7Z3	1.5AZ3	1.4AZ3*	1.4AY3	1.4AZ3	1.3AZ3/
3	/1.0Q	1.0Q	1.0AY1	1.0AY1	1.0Q	1.0AY1	1.0AY1	1.0AY1	1.0Q/
4	/1.1Q	1.1Q	1.1	1.1	1.1	1.2	1.1	1.1	1.1/
5	/1.1AY2	1.1AY1	1.2	1.2	1.1	1.1	1.0AX1	1.0AX1	1.0Q/
6			1.0	1.0	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/
7	/1.1Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/
8				/1.0Q	1.0Q	0.9Q	1.0Q	1.0Q	1.0Q/
9	/1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	0.9AY1	0.9Q	1.0Q	1.0AZ3
10		1.1Q	1.0Q	1.0AZ3	1.0Q	0.9AZ3	1.0	1.1	1.2
11	/1.0Q	1.0AZ3	1.0Q	1.0AY1	1.0Q	0.9Q	1.0Q	1.0AZ1	1.0Q/
12	/1.0Q	1.0AY1	1.0AY1	1.0AX1	1.1AX1	1.1BY3	1.1BY1	1.1AX1	1.1AY1/
13		1.3BY2	1.2BY3	1.1AY3	1.0AY1	1.0AY2	1.1AY2	1.1AY1	1.0AX1/
14		1.2BZ3	1.2BY3	1.1BZ3	1.1BY3	1.1BY3	1.3BY3	1.5CY3	1.6CY3/
15	/1.9CX	1.9CX	2.3BY3	2.1BY3	1.9BY3	1.9BY3	1.9BY3	1.7BY3	1.8BX3/
16					1.1BY2	1.0AY3	1.0AY3	1.0AY3	1.0AY3/
17					/1.0AY1	1.0AY1	1.0AX1		
18		1.1AX1	1.0Q	1.0AY3	1.1AX1	1.0AX1	1.0	1.0	1.0/
19	/1.1Q	1.1AX1	1.0Q	1.0Q/	/1.0Q	1.0Q			
20	/1.0Q	1.0Q	1.0Q		1.0Q	1.0Q			
21	/1.1Q	1.1Q			1.0Q	0.9Q	0.9Q	0.9Q	0.9Q/
22	/1.0Q	1.0Q		/1.0AZ3	1.0Q	1.0AZ3	1.0Q/		
23				1.0Q	1.0AZ3	1.0Q	1.0Q	1.0Q	1.0Q/
24		/1.0Q	1.0AZ2	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/
25	/1.1Q	1.1Q		1.0AY2	1.0Q	1.1Q	1.1AZ2/		1.2AX1/
26	/1.4BX2	1.6BY2/	/1.5BY2	1.6BX2	1.6BY3	1.8BY2			
27	/1.2BY3	1.2BY3			1.4BY3	1.5BY3	1.4AY2/		
28	/3.3CX3	3.3CX3	3.2CY3/		3.3CX3	2.9B2	5.9CX		3.2BY3/
29			1.3BY3	1.3BY3	1.4BY3	1.7CX3	1.8CY	1.6CX3	1.5BY3/
30	/1.4BY3	1.3BY3	1.2BY2	1.4CY3	1.2BY3	1.2BY3	1.1AZ3*	1.2BY3	1.2BY3/
31	/1.6CX3	1.7CX3	1.8CX3	1.6CY3	1.7CX3	2.2CY	2.6CX	2.0CY	1.2BX2/

SEPTEMBER 1952

UT Date	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22
1	/1.4AX1*	1.3AZ2	1.5AY2	1.7BY	3.0CX	1.8CY	2.5CX	1.8CY	1.5BY3/	
2		3.2CX3	1.5AZ3	1.9CY	2.1BY3	2.0BY3	1.6BY3	1.8	1.6/	
3	2.2BY		/1.4BY3	1.6BY3	1.2BY3	1.3BY3	1.4BY3	1.9CY	1.8CY3/	
4	1.2AY1	1.3BY3	1.AY2	1.1AY3	1.2AX1	1.3AZ3	1.2AY3	1.3AY2	1.1AY1/	
5	1.1Q	1.2AY2	1.0Q	1.0Q	1.0Q	1.0Q	1.0AY1	1.1BY2	1.2BX2/	
6	/1.1Q	1.0AY1	1.0AZ1	1.0AX1	1.0Q	1.0AY3	1.0Q	1.0Q		
7	/1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/	
8	/1.2Q	1.1Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/	
9	/1.2Q	1.1Q	1.0Q	1.0AX1	1.0AX1	1.0Q	1.0Q	1.0Q	1.0Q/	
10		1.1Q	1.0Q	1.0Q	1.1Q	1.0Q	1.0Q			
11	/1.2Q	1.1Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/	
12	1.1Q	1.1Q	1.0Q	1.0Q/				1.0Q	1.0Q/	
13			1.0AZ3	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/	1.0Q
14			/1.0Q	1.0Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q
15	/1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0/	
16					1.0Q	1.0Q	1.0Q/			
17	/1.3Q	1.1Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/	
18	/1.2Q	1.1Q			1.0Q	1.0Q/				
19		1.0Q	1.0Q/		1.0Q	1.0Q				
20					/1.0Q	1.0Q	1.0Q	1.0Q/		
21						1.0Q	1.1AY2	1.7CX3	1.4CY3/	
22	/2.1CX3	1.7BY3	1.3AZ3	1.3BZ3	1.4BZ3	1.3AZ3	1.2AY2	1.2AY2	1.2AY3/	
23	/2.1BX2	1.6BY3	1.2AY3/		1.2AY2	1.3BY3				
24		1.3Q/			/1.4BZ3	1.4BY3	1.4BY3			
25		1.7BY3			1.7BX3	1.6CX3				
26	/3.0BY	3.1BY/		/2.0BX2	1.8BY2	1.6BY3	1.5BY3	1.7BY3	1.6BY2/	
27	/1.4AY2	1.2AY3	1.2AY2	1.2AX2	1.2AY3	1.2AY2	1.1AZ3	1.2BY3	1.3BX3/	
28			1.3AY2	1.2AY2	1.2AY2	1.2AY3	1.2AY2	1.2AY2	1.2AY1	1.2AZ3/
29		/1.1Q	1.1AZ2	1.0Q	1.0AZ3	1.0Q	1.0Q	1.0Q	1.1Q	1.1Q/
30			1.2BY3	1.7BY2/	0.9AY2	0.9Q	0.9Q/			

Quiet Sun - 1-9 Sept. = 2.25; 10-22 Sept. = 2.15; 22-30 Sept, = 1.80

OCTOBER 1952

UT Date	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22
1	/1.0Q	1.0Q	1.0Q	0.9Q	0.9Q	1.1Q			
2	/1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9/
3	/1.1	1.1	1.0						
6		1.0Q	1.0Q	1.0Q	1.0AZ3	1.0AZ3*	0.9Q	1.0Q	1.0AZ3/
7		1.0Q	1.0Q	0.9Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q/
8		1.0Q/	/1.0Q	1.0Q	1.0Q				
9		1.1AY1	1.1AY1	1.1Q	1.1Q	1.0Q	1.0Q	1.1Q	1.0Q/
10		1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	
11	/1.1Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0AY2	1.0Q/
12		1.1AX1	1.1AX1	1.1AY1	1.2Q	1.2Q	1.1AY1	1.1AX1	1.1Q/
13		1.0AY1	1.0AX1/	/1.0Q	1.0Q				
14		1.0Q/		1.0AZ3	1.0Q	1.1Q/			
15		1.0Q		1.0Q	1.0Q	1.0Q/			
16		1.0Q/	/1.0Q	1.1Q	/1.1Q	1.0Q/			
17		1.0Q/		/1.1Q	1.1AY1				
18			/1.1Q	1.1Q	1.1Q	1.0Q	1.0Q	1.0Q	
19			1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	1.0Q	
20		1.0Q/		1.0Q	1.0Q			/1.0Q	
21		1.6BY2	1.5BY3	1.5BY2	1.6BY2	1.6AX1	1.5BY2	1.5AY1/	
22		1.6BY2	1.6BY3	1.7BY3	1.6BY3	1.7BY3	1.8BY3	1.7BY3	
23		1.4BY3	1.4BY3	1.4BX3	1.3BY3	1.4BY3	1.6BY3	1.4BY3	
24		1.2BY3/		1.1BY3	1.2BY3				
25						1.5BY2	1.6BY3	1.4BX1	
26		1.0Q	1.0Q	1.0Q	0.9Q	1.0Q	1.0Q	1.0Q	
27		1.0Q	1.0Q	0.9Q	0.9Q	1.0Q/	1.0Q	0.9Q	
28		1.0Q	1.0Q	0.9Q	0.9Q	1.0Q	1.0Q	1.0Q	
29		1.0Q	1.0Q	0.9Q	1.0Q	1.0Q	1.0Q/		
30		1.0Q	1.0Q	0.9Q	0.9Q	1.0Q	1.0Q	1.0Q/	
31		1.0Q	1.0Q	0.9Q	0.9Q	1.0Q	0.9Q	0.9Q/	

Quiet Sun = 1.80

NOVEMBER 1952

UT Date	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
1		/0.9Q	1.0Q	0.9Q	1.0Q	1.1Q	1.1Q	1.1Q/
2			1.1Q	0.9Q	1.0Q	1.0Q	1.0Q	1.0Q/
3		1.0Q	1.0Q	0.9Q	1.0Q	1.0Q	1.0Q	1.0Q/
4		1.0Q	1.0Q	0.9Q	1.0Q	1.0Q	0.9Q	0.9Q/
5		1.1Q	1.1Q	1.1Q	1.1Q	1.0Q/		
6		1.0Q	1.0Q	1.0Q	1.1Q	1.0Q	0.9Q	
7		1.0Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q	1.1Q/
8				1.1Q	1.1Q	1.1Q	1.0Q	1.0Q/
9					/0.9Q	0.9Q	0.9Q	0.9Q/
11		1.2	1.2	1.3	1.2	1.2	1.1	1.1/
12				1.3	1.2	1.2	1.1	1.2/
18		1.6BY3	1.6BY3	1.6BY3	1.8BY3	1.4BY2	1.3AY2	1.3AY2/
19	/1.3AX1	1.2AY1	1.3BY3	2.0CY3	2.2BY3*	1.9BY3	1.3AY2	
20	/1.3AY1	1.1AX1	1.2AY2	1.3AY2	1.2AY2	1.2AY2	1.2AZ3	
21		1.8BY2	1.6BY2	1.8BY3	1.8BY3	1.7BY3	1.5BY2	
22	/1.3AY1	1.3AY2	1.2AX1	1.2AY1	1.4BY2	1.2AY2	1.2AY2	
23		/1.2AX1	1.1AX1	1.1AY1	1.2AY2	1.1AY1	1.0Q	1.1AZ3
24		1.6BY3	1.3BY3	1.4AY3	1.4AX1	1.2AZ3	1.2AY2	
25		2.0BY3	1.8BY2	1.8BY2	1.8BX1	1.7BY2	2.0CY2	
26		/2.0BX1	2.1BY2	1.8CX1	2.7CX1	2.4BX1	2.4BX1/	
28		1.4AX1	1.5BY2	1.3BY2	1.3BZ3	1.2BY3	1.2AX1	
29		1.4AY3	1.2AY3	1.2AY2	1.1AX1	1.0AY2	1.2AY1	
30		1.3AY1	1.1AY1	1.1AX1	1.0AY1	1.0AY2	1.1AY3	

Quiet Sun; Nov. 1-12 = 1.60; 18-30 = 1.45

DECEMBER 1952

UT Date	13-14	14-15	15-16	16-17	17-18	18-19	19-20
1		1.0AZ2	0.9Q	0.9Q	0.9Q	0.9Q	1.0AY1
2		/1.0Q	1.0AY1	1.0AY1	1.0AX1	1.0Q	1.0Q/
3		1.0AX1	0.9AX1	0.9AY1	1.0BY2	1.0BY2	0.9AX1/
4		1.1AZ1		1.0Q	1.0Q	0.9Q/	
5	/1.1BY1	1.2BX1/		/0.9AY1	0.9AY1	0.9AZ1	1.0AY1/
6		1.4BY2	1.2BX3	1.1AZ3	1.0AY2	1.0AY2	1.0AY1/
7		1.2AY2	1.1AY2	1.1AY3	1.3AY3	1.3AZ3	1.4AX1/
8	/1.0AX1	1.3BY3/		1.2AY1	1.2AY1		
9		1.2AY1	/1.1AY2	1.1AY1	1.2BY3	1.2BY3	1.2BY3/
10		1.2AY1	1.1AY2	1.1AY1	1.1AY1	1.2AZ3	1.2AZ3/
11		1.6AY1	1.3AY1	1.1AX1	1.1AX1	1.0AX1	1.1AX1/
12		1.4AY2	1.2AY1	1.2AY1	1.3AY2	1.3BY3	1.3AY1
13		/1.3AY1	1.2AZ3	1.2AY2	1.1AY1	1.1AY1	1.1Q/
14			/1.3AY1	1.2AZ3	1.1AY2	1.1AZ3	1.1AY1/
15		1.6AY2	1.4AY2	1.2AY1*	1.0AY2	1.2AZ3*	1.0AX1/
16		/1.1AX1	/0.9Q	0.9AZ3	0.9Q	0.9AZ1	0.9Q/
17				1.1Q	1.1Q	1.0Q	1.1AX1/
18		1.9BZ3	2.4BY	2.3AY2	1.9BY3	1.5BY3	1.7BY3/
19		/1.2AZ3	1.2Q	1.0Q	1.0Q	1.0Q	1.0Q/
20		/1.3AY1	1.2AY1	1.1AX1	1.1Q	1.0AY1	1.1Q/
21		/1.2AX1	1.2AY1	1.0Q	1.0Q	1.0Q	1.1Q/
22		/1.0Q	/1.0Q	0.9Q	0.9Q	0.9Q	1.0Q/
23		/1.1AZ3	1.0Q	0.9AZ2	1.0AZ3	0.9Q	1.0Q/
24		/1.0Q	1.0AY1	0.8AZ1	0.9Q	0.9AZ3	1.0AY1/
26		/1.3AZ3	1.3BY3	1.1AZ3	1.2AY2	1.1AY2	1.2AY1*/
27		/1.2AX1	1.1Q	1.0AY1	1.0Q	1.0Q	1.1Q/
28		/1.1Q	1.1AX1	1.1Q	1.1AX1	1.1Q	1.1Q/
29		/1.2AZ1	1.2AX1	1.0AX1	1.1AY1	1.0AY1	1.1AX1/
30		/1.2AY1	1.1AY1	1.0Q	1.0Q	1.0AY1	1.2AY1/
31		/1.2AZ1	1.2AY1	1.1AY1	1.2AY1	1.1AX1	1.2AY1/

Quiet Sun = 1.45

APPENDIX I

References Added to the Bibliography

BIBLIOGRAPHY

The following references, grouped according to year of publication, have recently been added to the list of those collected for inclusion in future issues of the bibliography. For a description of the form in which the references are stated and a key to the abbreviations used, see page 2 of Bibliography of Extraterrestrial Radio Noise (Radio Astronomy Technical Report No. 11).

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